



Katangwe, T., Family, H., Sokhi, J., Kirkdale, C. L., & Twigg, M. J. (2020). The community pharmacy setting for diabetes prevention: A mixed methods study in people with 'pre-diabetes'. *Research in Social and Administrative Pharmacy*, 16(8), 1067-1080.
<https://doi.org/10.1016/j.sapharm.2019.11.001>

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[10.1016/j.sapharm.2019.11.001](https://doi.org/10.1016/j.sapharm.2019.11.001)

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The community pharmacy setting for diabetes prevention: a mixed methods study in people with ‘pre-diabetes’

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Funding

This work was supported by the Harold and Marjorie Moss Trust fund, Boots UK and the University of East Anglia.

Conflicts of interest

CLK and TK are employees of Boots UK. CLK is part of the PhD research team and TK is employed part-time as a pharmacist whilst undertaking her PhD.

Abstract

Background: Diabetes Prevention Programs (DPPs) comprising intensive lifestyle interventions may delay or even prevent the onset of type 2 diabetes in people with pre-diabetes. However, engagement with DPPs is variable with session times and transportation being reported amongst barriers; this may be addressed by community pharmacy (CP) involvement given its recognition for accessibility.

Objectives: To explore factors influencing engagement with the National Health Service (NHS) DPP and the role of CP in diabetes prevention.

Methods: Nine hundred and sixty-two questionnaires were posted to people with pre-diabetes identified from five general practices in Norfolk, England between November 2017 and May 2018. Follow-up semi-structured interviews (n=10) and a focus group (n=6) were conducted with a sample of questionnaire respondents. Questionnaire data were analysed quantitatively using SPSS and qualitative data analysed inductively using thematic analysis. Themes relating to engagement and the role of CP in pre-diabetes were further analysed using the COM-B model of behaviour change.

Results: A total of 181 (18.8%) questionnaire responses were received, a quarter of whom reported to have either dropped out or declined attending the national DPP. DPP engagers were more likely to report the program location and session times as convenient. Community pharmacy was perceived as an acceptable setting for delivering diabetes prevention services (DPS) and a preferable alternative for regular pharmacy users and people with work and social commitments. Participants felt that opportunity to engage with CP DPS could be enhanced by its accessibility and flexibility in making appointments. Knowledge about the DPS provided in CP and previous experience with CP services were central influences of capability and motivation to engage respectively.

Conclusions: This research outlines factors that could influence engagement with community pharmacy-based DPS and provides evidence to inform intervention development. Further research would be required to determine the feasibility and cost-effectiveness of such interventions.

Introduction

In England, an estimated 2.7 million people are living with type 2 diabetes ¹ for which the National Health Service (NHS) incurs an annual spend of approximately £8.8 billion (10% of the total budget) ². Additionally, five million people in England are estimated to have 'pre-diabetes', a term used to denote blood glucose levels above normal range but not high enough for diagnosis of type 2 diabetes ^{3,4}. The risk of developing type 2 diabetes depends on multiple risk factors, of which obesity is most significant ⁵.

Central to the approach for the prevention of type 2 diabetes is the promotion of healthy diet and exercise to reduce obesity ⁶. Evidence suggests that if individuals with pre-diabetes are identified and intensive lifestyle interventions are implemented early, the onset of type 2 diabetes may be delayed or even prevented ⁷⁻¹⁵. In England, the NHS Diabetes Prevention Program (NHS DPP) has been implemented in light of this evidence ¹⁵. The DPP is a 9-month intervention which identifies people with pre-diabetes, primarily through retrospective screening of general practice databases, and refers them onto a behavioural change intervention to reduce their risk of developing type 2 diabetes ¹⁶. The intervention, consisting of at least 16 hours contact time spread across a minimum of 13 sessions, is delivered predominantly by face to face group sessions with a maximum of 20 people in each group¹⁷. The sessions last between 1-2 hours and deliver education (type 2 diabetes and its risk factors, weight loss, dietary and physical activity), provide support to increase physical activity (e.g. by providing pedometers) and offer strategies for maintaining lifestyle changes¹⁷.

The national program is commissioned and funded by NHS England and is delivered nationally by framework providers who are selected through a national commercial procurement process conducted every four years ^{16,18}. The program can be delivered by both primary healthcare providers (e.g. community pharmacy and general practice) and non-healthcare providers (e.g. voluntary or private sector organisations).

The program was first launched in 2016 despite systematic review evidence suggesting that its impact could be undermined by several factors including poor uptake amongst people with pre-diabetes ¹⁹. The review highlighted high withdrawal and attrition rates in clinical trials associated with evidence for DPPs, with only 27% of the identified population with pre-diabetes completing the intervention. Similar findings were also identified in a study evaluating an existing community-based DPP in England ^{20,21}. The study demonstrated low uptake (23% of the targeted population) following initial invitation letters mailed from 17 general practices which further decreased to 10% just before randomisation to the

intervention and control arm. Early progress reports on the uptake of the NHS DPP indicate that of those referred to the program, 49% attend initial assessment and between 36% and 55% decline to participate^{17 22}. Additionally, of those who accept to participate, a further cohort of between 26% and 50%, do not progress onto the group based sessions¹⁷. Although, there is currently no published research investigating reasons for low uptake of the NHS DPP, evidence from qualitative research investigating participation in DPPs has highlighted accessibility, work and social commitments and practical challenges with organising group-based session times to be amongst the common barriers to participating²³.

Systematic review evidence suggests primary healthcare and community settings have the greatest reach to people with pre-diabetes^{24 25}. In England, community pharmacy is the most visited primary care setting and is accessible to approximately 90% of the population within a 20-minute walk²⁶⁻²⁸. The settings' often convenient locations and extended opening hours (including weekends)²⁹, directly addresses some of the identified barriers to DPP uptake³⁰. In other countries such as the USA, where the implementation of a national DPP has demonstrated success in achieving both weight loss and increasing physical activity, recommendations for further expansion³¹ have resulted in the development of clear guidance for the delivery of DPPs in settings such as community pharmacies³².

In the UK, however, despite guidelines recommending delivery of DPP in primary healthcare settings, there are currently no community pharmacy-based Diabetes Prevention services (DPS) being provided⁴. Although some community pharmacies deliver opportunistic screening and mainly refer to general practice services^{33 34}, there are currently no routine lifestyle interventions being delivered in this setting for people with pre-diabetes and neither are there clear guidelines of how community pharmacy teams could deliver lifestyle interventions for this population.

Additionally, barriers and facilitators to engagement in the current program are largely unknown. Although previous research has identified likely barriers and facilitators to participation, DPP interventions delivered in the studies were dissimilar to the current NHS DPP and included factors likely to enhance participation. For example, Laws *et.al.* describe an intervention with a significant involvement of healthcare personnel such as general practitioners, nurses and dieticians, a factor which was identified as influencing participation in DPPs³⁰. Similarly Smith *et.al.* also describe an intervention which included factors that potentially encouraged participation including involvement of social (partners) and external support networks (telephone calls from health coaches)^{21 35 36}. Therefore, with the current NHS DPP delivered by mainly non healthcare personnel and not including support networks

and personalised support, it is important to establish contextual barriers and facilitators to participation in the program in order to establish the context in which community pharmacy may play a role.

The COM-B approach offers a theoretical model for identifying key factors influencing the desired behaviour^{37 38}. The model recognises that behaviour (B) is brought about by interacting components including Capability (C), Opportunity (O) and Motivation (M). The COM-B model forms the hub of the Behaviour Change Wheel (BCW), and is linked to intervention functions and policy categories that could be used to select and design appropriate interventions^{38 39}. In this study, the COM-B was applied to understand two target behaviours: (1) people with pre-diabetes engaging in the NHS DPP and (2) people with pre-diabetes engaging with community pharmacy-based diabetes prevention services (DPS). Analysing these behaviours using the COM-B would help identify behavioural determinants and assist in developing future interventions that could enhance engagement of people with pre-diabetes in community pharmacy-based DPS through the application of the BCW. The development of community pharmacy-based DPS, however, are beyond the scope of this research. The aim of this research is to explore factors influencing engagement with the current NHS DPP and elicit views from people with pre-diabetes on the role of the community pharmacy in diabetes prevention using the COM-B to frame the data collection, analysis and future direction of interventions aimed at patients and healthcare professionals. The term 'engagers' as used in this study referred to participation sessions of the NHS DPP whether partial, current or complete whereas 'non-engagers' referred to participation in none of the sessions. This study therefore adopted five categories referred to as 'engagement status' to describe participant engagement with the NHS DPP and these included 'dropped out (partial engager)', 'attending (current engager)', 'completed (complete engager)', 'declined (non-engager)' and 'waiting for assessment (non-engager)'. These groups were adopted from the current classification of patients in the NHS DPP.

Methods

Study design

This research adopted a pragmatic epistemology and used mixed methods consisting of a questionnaire, a focus group and interviews to address the study objectives ⁴⁰. Ethical approval was obtained from the Health Research Authority (IRAS project ID: 227930) before commencing the research. The study took place in Norfolk between November 2017 and May 2018.

Rationale for study design

This study adopted the explanatory sequential mixed method design whereby qualitative and quantitative data are collected sequentially in two phases⁴¹. The questionnaire data were collected and analysed in the first phase and in the second phase, qualitative (interviews and focus group) data were collected and analysed to explain or to get a deeper understanding of the findings from the questionnaire.

The questionnaire method was adopted following a literature search of factors influencing participation in DPPs which provided sufficient insight to enable the exploration of engagement in the current NHS DPP ^{23 35 42}. The questionnaire also provided the most efficient way, in terms of time and cost, to obtain data from a large sample of participants ⁴³. A focus group and semi-structured interviews were conducted in order to facilitate a deeper understanding of questionnaire responses with regards to influences on engagement with the NHS DPPs and the role of the community pharmacy in preventing type 2 diabetes ⁴⁴.

Focus groups were the preferred data collection methods as they are especially useful for confirming insights from a wide variety of participants ⁴⁴. In this study which enrolled participants with diverse experiences of engagement with the NHS DPP and community pharmacy services, it was important for data generation to include an exchange of viewpoints and experiences in order to give participants the opportunity to reflect and consider their own standpoint in light of what they hear from others. Thus in this study, the use of focus group discussions, which is thought to facilitate the refinement of individual responses, was viewed to be appropriate ⁴⁴.

In order to provide a more accessible option to the studied population and encourage participation, an option of either face to face or telephone interviews was given as an alternative to attending a focus group ⁴⁴.

Routine NHS DPP inclusion criteria

General practices: All general practices operating within the 27 areas selected for the initial implementation of the NHS DPP in England (Including Norfolk) were eligible to provide pre-diabetes screening and referral services to the NHS DPP. Participating general practices were primarily required to identify eligible individuals for referral to the NHS DPP by performing retrospective screening of their databases.

People with pre-diabetes: People with pre-diabetes were primarily identified for referral to the NHS DPP during routine primary care appointments or through retrospective screening of general practice databases. Eligible patients for referral were individuals who were 18 years or over and had an HbA_{1c} blood tests within the pre-diabetes range (42-47mmol/mol (6.0-6.4%)) in the last 12 months ⁴⁵. Following identification, individuals were sent letters communicating their risk and inviting them to participate in the NHS DPP in order to lower the risk of developing type 2 diabetes ⁴⁶. At this point patients could voluntarily enrol onto the program by contacting the providers via a telephone number highlighted in the referral letter. General practices kept track of individuals identified through screening based on feedback they received from NHS DPP providers.

Study recruitment

General practices: General practices were the participant identification site for this research. All general practices in Norfolk who were participating in pre-diabetes screening and referral to the NHS DPP were eligible for the study. Participating general practices were identified via the North Norfolk Clinical Commissioning Group (CCG), an NHS organisation responsible for the planning and commissioning of healthcare services for the local area

At the time the study commenced the NHS DPP was undergoing implementation across Norfolk. Therefore, to ensure the recruiting of participants who had adequate experience with the NHS DPP, only practices that had been participating in the NHS DPP for at least six months were invited to participate in the study by the research team. Participating general practices were reimbursed a one-off payment of £75 for identifying participants and posting questionnaires.

People with pre-diabetes

Identification of eligible participants was performed by general practice staff by retrospective screening of databases. All patients who met the following inclusion/exclusion criteria were invited to participate:

Inclusion criteria

- Registered with a GP practice in Norfolk
- Referred to the NHS DPP in the previous 12 months

Exclusion criteria

- Non-English speaking
- History of type 2 diabetes
- Unable to give consent

Following identification of potential participants by general practices, questionnaires provided by the research team were mailed to eligible participants. As part of the questionnaire, participants were given an option to express an interest in interview or focus group participation. Identification of participants was anonymous with the researchers not seeing any patient identifiable data until completed questionnaires were returned to the research team.

Sampling and sample size

Questionnaire

At the time of conducting the study, the NHS DPP was undergoing implementation in Norfolk, which was one of the first wave of 27 areas across the UK. North Norfolk and Norwich, consisting of 60 general practices in total, were the initial areas to start the screening and referral processes. Based on participation data provided by North Norfolk CCG we planned to approach all 9 practices that had completed the identification and referral processes within these areas. These practices had a recorded total of 1,570 patients who had received a letter inviting them to participate in the NHS DPP and has initiated first contact with the providers. Based on the assumption that, all 9 practices would participate in the study, we planned to mail questionnaires to all 1,570 patients. Based on previous work, which used a similar method of recruiting a 10-20% response rate was expected, giving 150 to 300 questionnaire responses. Questionnaires were sent to all eligible participants regardless of their NHS DPP engagement status.

Interviews and focus group

Participants expressing willingness to be contacted for the qualitative element were identified from returned questionnaires. To gain the perspectives of both engagers and non-engagers in the NHS DPP, a purposive sampling method, based on questionnaire responses was used to select participants⁴⁴. Selection of participants was primarily based on NHS DPP engagement status. Diversity was further sought by selecting participants according to employment status and community pharmacy use. The aim was to achieve maximum variation with regards to engagement with the NHS DPP and to obtain a diverse experience with community pharmacy service use. With respect to age, gender and employment, as most participants were older, female and retired, balance was sought by specifically also targeting younger, male or employed participants.

Selected participants were sent an invitation letter and an information sheet and were given at least two weeks to read the information sheet before making a final decision to participate in the research. The selection of participants was an iterative, ongoing process whereby selection criteria for subsequent interviews were constantly being modified to ensure intended diversity of participants was achieved. The selection of participants and data collection was therefore performed in parallel between December 2017 and April 2018. The number of interviews and focus groups conducted was based on participants' availability and data saturation⁴⁴. In this study data saturation was determined by the degree to which new data was expressed in previous data and thus had an emphasis on data collection rather than data analysis. Data saturation was therefore determined when there was no additional data expressed in new data⁴⁷.

Participants were offered a £10 voucher as a thank you for participation and had their travel expenses reimbursed.

Data collection

Questionnaire

The questionnaire consisted of 4 sections which collected the following information: 1) demographics including NHS DPP participation, 2) feedback on the NHS DPP including accessibility, 3) community pharmacy use including general views on community pharmacy based DPS, and 4) expression to participate in further research. The full questionnaire has been provided in Appendix 1. The first 3 sections consisted primarily of Likert scale questions and also included open ended questions in order to cover topics that had not been addressed by the closed questions. Respondents who had engaged with the NHS DPP were

asked to provide comments on various aspects of the programme and those who had not engaged were asked to comment on influences behind their decision.

Questions exploring general views on potential engagement with community pharmacy based DPP were formulated by the research team^{37 48}, to explore participants' views on the use of the setting for delivering DPS as well as willingness for participation.

Questions exploring NHS DPP accessibility were based on previous qualitative research which had identified common barriers and facilitators to participation^{23 35 42}. The questionnaire, although primarily designed to validate accessibility barriers and facilitators identified from previous qualitative research within the context of the NHS DPP, also sought to explore other factors influencing engagement with the NHS DPP.

Interviews and focus groups

Interviews were conducted by the chief investigator (TK) and lasted up to one hour. The focus group was conducted by two members of the research team (TK and MT) at the University of East Anglia and lasted approximately 90 minutes. The focus group and interviews were digitally audio recorded and a semi-structured topic guide based on the COM-B model³⁷ was used to facilitate the discussions (Appendix 2). Topics explored included experiences with pre-diabetes diagnosis, influences behind engagement or non-engagement, experiences with the NHS DPP or alternatives, experiences with community pharmacy services and views on community pharmacy delivering DPS. Researchers obtained written or verbal consent for focus group and interviews respectively.

Analysis

Questionnaire

SPSS statistics (version 23; IBM Corp) was used for questionnaire data analysis. Medians (Interquartile ranges (IQs)) were used to describe the data. Data was explored to identify the distribution of respondents' feedback on the NHS DPP, community pharmacy use and views on community pharmacy based DPS. To conduct inferential statistics on influences of NHS DPP accessibility on participation (location and session times), program outcomes (weight and physical activity) and feedback on the program (satisfaction and perceived need for the program) participants were separated into groups based on their engagement (i.e. engagers and non-engagers) (Kruskal-Wallis test and Mann Whitney U). Additionally, descriptive analysis (n (%) and Medians (IQs)) was performed to analyse data on community pharmacy use. Participants were again separated into groups based on their use of community pharmacy and general practice to conduct inferential statistics on their views on the

involvement of community pharmacy in delivering DPS (Mann Whitney U). Data from participants who had their engagement status and community pharmacy use missing were excluded from relevant sections of the analysis.

Qualitative element: Interviews and focus groups

Interview and focus group recordings were transcribed verbatim by a member of the research team or a paid transcription contractor, loaded in NVivo 11, and then checked for accuracy by listening back to the original recording (TK). All written comments made on the open-ended sections of the questionnaires were transferred onto a Word document and combined with interview and focus group data in NVivo for analysis. To provide an iterative process Braun and Clarke's six phases of thematic analysis was utilised ⁴⁹.

Transcribed data were read and re-read to gain an overview of the content and identify topics of interest that were linked to the research questions (*1. Familiarisation*). The transcribed data was then re-read and inductively coded by the main researcher (TK) (*2. Inductive coding*). The coding process was then discussed with another member of the research team (MT) to assist the development of themes. Relationships between the codes were sought in order to develop subthemes and subsequent themes by two members of the research team (TK and MT) (*3. Development of themes*). Any disagreements were resolved by consensus following discussion, referring back to the coded and original transcripts. Transcripts were again revisited by a member of the research team (TK) to ensure correspondence between the developed themes and the data and to develop a richer description of the themes (*4. Reviewing themes*). Each theme was given a name which captured the essence of the contents and transcripts were again revisited to identify representative extracts to use in the written analysis (*5. Defining themes*). Extracts were selected to ensure a balanced representation of participant characteristics in terms of engagement with the NHS DPP and study involvement (questionnaire, focus groups and interviews). Theme descriptions and extracts were discussed with another member of the research team (MT). A narrative of the themes was written using extracts identified as illustrative evidence (*6. Reporting*).

To obtain a deeper understanding, codes of the themes associated with two target behaviours *i.e.* (1) people with pre-diabetes engaging in DPP and (2) people with pre-diabetes engaging with community pharmacy based DPS, were categorised as barriers and facilitators to facilitate further mapping onto the components of the COM-B model. Mapping was conducted according to the heuristic subdivisions of each of the components of the

COM-B model where Capability can be either 'physical' (e.g. physical skills) or 'psychological' (e.g. knowledge) ability to perform the behaviour; Opportunity can be 'physical' (e.g. Resources) or 'social' (e.g. interpersonal influences); Motivation may be 'reflective' (e.g. beliefs about what is good or bad) or 'automatic' (e.g. processes involving wants and needs).

Mapping processes were conducted with reference to the target behaviours and aided by discussion amongst the research team ⁴⁴. The process involved mapping coded interviewee narratives to relevant COM-B categories. However, where there was overlap between COM-B categories, discussions were held amongst the research team and interviewee narratives mapped to the COM-B category relevant to the "primary determinant". The 'primary determinant' was considered as the starting point / root cause of a barrier or facilitator.

Mapping was conducted by the main researcher (TK) and then discussed with another member of the research team (MT). The final mapping was then re-analysed independently by another member of the research team with expertise in psychology and using the COM-B (HF). Any disagreements were resolved by consensus following discussion with two other members of the research team (TK and MT).

Results

Questionnaire: NHS DPP

Nine hundred and sixty-two questionnaires were posted via five general practices which agreed to participate resulting in 181 (18.8%) responses. Participants' demographics and NHS DPP engagement status are summarised in Table 1. The majority of the respondents were white 176 (97.8%) and almost half reported to have either completed the program or were still attending sessions. A quarter of respondents reported to be waiting for an initial assessment following contact with the service providers.

Feedback on the NHS DPP is summarised in Table 2. There were significant differences between the groups in terms of convenience of program location and session times with a general trend being towards agreeing or strongly agreeing for those who were attending, had completed or had dropped out of the program compared to those who had declined or were waiting for an initial assessment (Kruskal-Wallis test: $p < 0.001$ ($\chi^2 = 38.69$, $df = 4$) and $p < 0.001$ ($\chi^2 = 29.99$, $df = 4$) respectively).

There was also a variation between 'non-engagers' (waiting for an initial assessment and declined) with regards to feeling the need to attend the program. Those who had declined agreed to feeling that they did not need the program (Mann Whitney U, $p=0.014$) whilst those who were waiting had no strong views about whether they needed the help of the program. Overall feedback on the NHS DPP from 'engagers' (attending, completed and dropped out) was positive. There was little variation in feedback about program outcomes, with most respondents reporting the program to have successfully helped them in achieving weight loss and increasing physical activity. However, overall satisfaction with the program and views concerning the helpfulness of group sessions varied amongst the three groups with responses being less positive amongst people who had dropped out of the program.

Table 1: Questionnaire participant characteristics

Characteristics	N	Measure	Classification	Responses
Replied	962	% (n)		18.8 (181)
Female	180	% (n)		57.2 (103)
Age (Years)	180	Mean (SD)		69.0 (10.0)
Employment status	181	% (n)	Employed	22.7 (41)
			Student	5 (9)
			Retired	70.2 (127)
			Unemployed	2.2 (4)
NHS DPP engagement status	167	% (95% CI)	Waiting	25.7 (19.1, 32.2)
			Attending	24.6 (18.1, 31.1)
			Dropped-out	9.6 (5.1, 14.1)
			Completed	25.1 (18.5, 31.7)
			Declined	15.0 (9.6, 20.4)

Table 2: Feedback on NHS DPP

Questionnaire statement (Median (IQ))	Waiting n=24	Attending n=38	Completed n=41	Dropped-out n=15	Declined n=20	Result
The location of the programme was convenient for me	3 (3,4.75)	4 (4,5)	5 (4,5)	4 (4,5)	3 (2,3)	<0.001 *
The times that the sessions were offered were convenient for me	3 (2, 5)	4 (4,5)	5 (4,5)	3.5 (2,4)	3 (2,3.5)	<0.001 *
I found attending the sessions as a group helpful	-	4 (4,5)	5 (4,5)	4 (3,4)	-	0.019 *
The programme has helped me or is helping me to lose weight	-	4 (4,5)	4 (4,5)	4 (2,4)	-	0.075 *
The programme has helped me or is helping me to exercise more	-	4 (3,5)	4 (3,4.75)	4 (2,4)	-	0.045 *
Please indicate your level of satisfaction with the programme	-	4 (4,5)	5 (4,5)	3 (2,4)	-	0.001 *
I feel like I need the programme	3 (3,4.25)				2 (2,3)	0.014 **

Likert scale: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), strongly agree (5)

* Kruskal-Wallis Test

** Mann Whitney U

Questionnaire: community pharmacy

Most participants reported taking prescribed medication (88.6% (156)). In total, 59.5% reported collecting their medication from community pharmacy rather than dispensing general practices (practices that dispense medicines they prescribe to patients living remotely from a community pharmacy). Ninety three percent of participants on prescribed medication collected their medication in person. A larger proportion of respondents (82.8%) who collected medication from the community pharmacy reported visiting the pharmacy more frequently i.e. either once a month or most days than those who collected medication from dispensing doctors (54.1%). Most of the respondents who collected their medication from a local community pharmacy reported a shorter travel distance (1-2 miles, 90.4%) compared to those collecting their medication from dispensing general practices (+3 miles, 44.3%).

Table 3 summarises the reported use of community pharmacy services by respondents. Most respondents reported using community pharmacy for either over-the-counter services, information/advice or screening services. Just over a quarter of respondents reported to have either never heard of or used any of the listed community pharmacy services.

Table 3: Community pharmacy services use

Which community pharmacy service have you used before?	Service description	Total (N=157) % (n)
Over the counter advice	Clinical advice on non-prescription medicines for a range of minor illnesses, such as coughs, colds, fungal infections, and aches and pains. This advice also includes diet and lifestyle recommendations and signposting to more appropriate services for more serious conditions	29.7 (47)
Blood Pressure check	A blood pressure screening service	25.3 (40)
NHS Health check	A screening service designed to predict the 10 year risk of developing heart disease and offer lifestyle advice and intervention where necessary. The check is for adults in England aged 40-74 and consists of a combination of weight measurements, blood pressure, blood glucose and cholesterol screening, diet and physical activity information	19.0 (30)
Cholesterol check	A cholesterol screening service	17.7 (28)
Health leaflets	Free health-related leaflets on various conditions including diabetes and hypertension	16.5 (26)
Diabetes check	A diabetes screening service (random or fasting plasma glucose test)	14.6 (23)

Smoking cessation	A one to one service delivered by trained pharmacy advisers that provides a range of proven smoking cessation methods. The program provides information and advice on stopping smoking, as well as professional support, during the first few months following cessation	4.4 (7)
Weight loss program	A service delivered by trained pharmacists to support patients to lose weight through the provision of diet and lifestyle advice and goal setting	1.3 (2)
Other	Other services including seasonal influenza vaccination services and medicine related services (e.g. medicines use reviews)	4.4 (7)
None/never heard of these	N/A	28.5 (45)

Table 4 illustrates the responses about the role of community pharmacy in diabetes prevention. People who collected medication from community pharmacy were more inclined to think that community pharmacy was capable of delivering DPS ($p=0.023$). Most respondents agreed that they would consider using community pharmacy for diabetes prevention services and would be motivated to attend community pharmacy based DPS. There was no significant difference in participants' motivation ($p=0.076$) and consideration ($p=0.124$) to use community pharmacy for DPS between people who collected their prescriptions in community pharmacy and those who collected their medication in dispensing doctors.

Table 4: Views on potential engagement with and delivery of community pharmacy diabetes prevention services

Questionnaire statement	All participants N = 162	Collects prescribed medication from community pharmacy N=90	Collects prescribed medication from dispensing GP practices N=54	p-value Mann-Whitney U
	Median (IQ)			
I think community pharmacy is capable of providing a diabetes prevention service	4 (3,4)	4 (3,4)	3 (3,4)	0.023
I would consider community pharmacy for a diabetes prevention service	4 (3,4)	4 (3,4)	4 (3,4)	0.124
I would be motivated to attend a pre-diabetes screening or prevention service provided by the community pharmacy team	4 (3,4)	4 (4,4)	4 (3,4)	0.076

Interviews and focus groups

One hundred and four respondents (57.5%) expressed an interest in the qualitative element of the study. With most participants opting for interviews, one focus group consisting of 6 participants and 10 telephone interviews were conducted. Table 5 presents the demographics of the 16 participants purposively sampled to participate in the qualitative element. A participant identification key for the illustrative quotes used in this report is also provided in Table 5. There were slightly more females than males and more were retired than employed. There was an even distribution across those who had engaged with the NHS DPP (completed or attending (n= 6)) and those who had not (declined or dropped out (n=7)). The sample also included participants who were waiting for initial assessment (n=3). One hundred and forty-four participants responded to the open-ended sections of the questionnaire and these responses were included in the analysis. The thematic analysis produced four main themes 1) Perceptions of pre-diabetes 2) Factors influencing engagement in the NHS DPP 3) Feedback on the NHS DPP and 4) The role of community pharmacy in pre-diabetes. Two themes ('Factors influencing engagement in the NHS DPP' and 'The role of community pharmacy in pre-diabetes') were identified as closely linked to the target behaviours ('people with pre-diabetes engaging in DPP' and 'people with pre-diabetes engaging with community pharmacy based DPS') respectively. Tables 6 and 7 present the mapping of the codes associated with these two themes to the components of the COM-B model.

1. Perceptions of pre-diabetes

Participants expressed a lack of awareness of pre-diabetes prior to diagnosis. Reactions following diagnoses were mainly that of shock particularly due to positive self-perception about diet, lifestyle and lack of family history. Those who were not shocked were clearly able to relate the diagnosis to risk factors such as age, weight, family history, co-morbidities and poor dietary choices. Whilst a few participants were not concerned with the diagnosis and had made the conclusion that the risk of developing diabetes was not serious, others highlighted the need for earlier interventions, prior to a formal diagnosis of pre-diabetes, to address poor lifestyle behaviours before they became an issue.

'I know I'm a wee bit overweight but not extortionately and we have a very healthy diet in so much as we eat plenty of fruit and vegetables... nobody else in my family is diabetic so it did take me by surprise that I could be going that way' [I-017, attending]

'I think you drift into bad habits and if someone says to you your blood sugars are increasing every time you might find it easier to amend your habits earlier on in the process rather than go and say 42 [meaning HbA_{1c} reading] now this is what you need to do' **[FG-025, waiting]**

Table 5: Characteristics of interview and focus group participants

Characteristic	Total (N=16) N (%)
Age (Mean (Standard deviation))	68.4 (5.6)
Gender	
• Female	9 (56.3)
Employment status	
• Employed	4 (25)
• Retired	12 (75)
Engagement status	
• Attending	3 (18.8)
• Completed	3 (18.8)
• Waiting	3 (18.8)
• Dropped out	2 (12.5)
• Declined	5 (31.3)
Community pharmacy use	
• About once a month	4 (25)
• Once every two to three months	1 (6.3)
• Two or three times a year	8 (50)
• Never	3 (18.8)
Key for illustrative quotes:	
FG = focus group participant, I = interview participant, Q = participants' response to open-ended questionnaire sections. All participant identifiers include a questionnaire reference number and NHS DPP engagement status.	

2. Factors influencing engagement with the NHS DPP

There were several factors that influenced participation in the NHS DPP following diagnosis of pre-diabetes. Table 6 summarises barriers and facilitators to engagement mapped to the COM-B, along with illustrative quotes. The target behaviour linked to this theme was 'people with pre-diabetes engaging in DPPs'.

Capability

Physical ability to participate in sessions of the NHS DPP, particularly group exercises, was identified as a key enabler for engaging with and completing all program sessions. To this end some participants described being hindered by co-morbidities such as arthritis and only engaging in the educational elements of the program.

Opportunity

Program location, session times and transportation, contributed to both facilitators and barriers to engagement. Participants felt that session times, which run during working hours, were more accessible for those without work commitments. Social influences on uptake arose from a variety of networks including employers where some participants described employers allowing them to have time off work to attend sessions of the programme. Other participants, however, described making decisions to engage based on advice sought from healthcare professionals, particularly GPs and nurses. Some of these participants described practitioners advising them against participating based on their beliefs of the benefits of the program and the availability of spaces on the program.

Motivation

A variety of reflections influenced lifestyle changes and engagement with the NHS DPP. Participants' perceived own ability of making dietary changes and increasing physical activity, without intervention from the NHS, influenced some to disengage from the national program. These participants described making changes which had resulted in positive outcomes such as weight loss, lower HbA_{1c} and blood pressure. Group-based sessions also appeared to be a deterrent to some who acknowledged this to be attributable to personal preference.

Participants also described making decisions to engage with the program based on perceived potential health benefits as well as perceived reliability of alternative sources of help such as online information. Participants' beliefs about the consequences of type 2 diabetes, which were mainly based on family history or other observations, also influenced engagement. Whilst some participants with a family history of type 2 diabetes were more

inclined to engage with the national program others felt that their experience with the condition had given them enough information and knowledge to support them in making lifestyle changes and therefore chose not to engage. Emotional responses to diagnosis, particularly fear of diabetes and complications, served as motivators to making lifestyle changes or engaging with the program. Participants also described being motivated by self-conscious intentions and goals such as losing weight or improving prognosis of co-morbidities such as arthritis. Finally, one participant in particular felt strongly that their reason for wanting to engage with the help offered by the NHS DPP was influenced by their view of the role of the NHS and that they should be doing everything they can to prevent additional burden to the health service.

Table 6: A COM-B analysis of factors influencing engagement with the NHS DPP

COM-B model component	Component definitions	Mapped codes		
		Barriers	Facilitators	Illustrative quotes
Capability	Physical i.e. physical skill, strength or stamina to perform the behaviour	Co-morbidities		<i>"My level of exercise has been hampered by other health problems" [Q-98, completed]</i>
	Psychological i.e. knowledge or psychological skills, strength or stamina to engage in the necessary mental processes			
Opportunity	Physical i.e. opportunity afforded by the environment involving time, resources, locations, cues, physical affordance	Location Transportation	Location	<i>"I don't drive, so one of the questions I asked him [GP] where do these sessions take place, because if I need to go to [location] or somewhere to do it, it's not easy you know. It adds another several hours to the day for me" [I-19 declined]</i>
		Session times Social/work commitments		<i>"It was a bad time of the day you know, effectively I lost a day's work by the time I got up there and got back" [I-81, dropped-out]</i>
	Social i.e. opportunity afforded by interpersonal influences, social cues and cultural norms that influence the way that we think about things e.g. the words and concepts that make up our language		Employer support	<i>"It is quite a commitment though. I work full time and I've been very lucky in that my employers let me go every week" [FG-91, completed]</i>
		Healthcare professionals' influence		<i>"I said 'do I need to do this prevention programme?', because I am quite happy to do it if you think it is advisable', and he [GP] said, 'well I'm not sure it's going to do you a lot of good, you're already eating healthily and you're losing weight'" [I-19 declined]</i>
Motivation	Reflective motivation i.e. reflective processes involving plans (self-conscious intentions) and evaluations (beliefs about what is good and bad)	Self-help (existing knowledge of dietary management)		<i>"I think from my own diet management really I seem to have got myself back within the bounds or within the figures I should be" [I-115, dropped-out]</i>

		Group-based sessions		<i>"I am not one for being in a mixed crowd, I'd rather be on my own" [I-29, declined]</i>
		Perceiving no additional benefit from the program	Perceiving positive health benefits from the program	<i>"I have a general idea you know. I listen to the radio and I watch television and you hear from programs there about how to cope with diabetes and how to make your lifestyle better, so I thought what am I going to gain by doing some yet another class as it were" [I-40, declined]</i>
		Family history	Family history	<i>"My brother has it [type 2 diabetes]. It's a nuisance and it affects him in a way which I thought well I don't want to be in that situation. In fact, I thought I am not going to be in that situation full stop." [I-18 completed]</i>
			Perceiving online information sources to be less reliable	<i>"In a way I was happy to wait for more expert advice, because whilst I obviously used internet and google to check things out, you get a lot of information, some of which is conflicting. So it's not always the best source" [I-18 completed]</i>
			Weight loss	<i>"I've got to be fair and say I went more with the idea of trying to lose some weight than actually preventing diabetes. I've got to be honest about that" [I-42, completed]</i>
			Saving NHS money	<i>"It's a dreadful thing to think that I might be costing the NHS money because I am ill-disciplined, and that is really why I want to take it more seriously" [FG-32, waiting]</i>
	Automatic motivation i.e. Automatic processes involving emotional reactions, desires (wants and needs), impulses, inhibitions, drive states and reflex responses.		Fear of diabetes and complications	<i>"To be honest, I would hate to be diabetic. If I had to give myself injections I just don't know how I could handle that. I know people who have had it affects other parts of your health and that frightens me" [I-17, attending]</i>

3. Feedback on the NHS DPP

Feedback from participants who engaged with the national program, including those who had dropped out, largely reflected the 'one size does not fit all' notion with some giving positive feedback and others giving negative feedback on the same aspects. Participants who had attended some sessions or had completed the program described the location as accessible and session times as convenient whilst those who hadn't engaged had opposing views including a lack of flexibility in program delivery. Participants who had attended some sessions of the program gave largely positive feedback and expressed positive outcomes achieved including raised awareness in making healthy dietary choices, weight loss, increased physical activity and reduced HbA_{1c}. Some participants also reported positive outcomes with comorbidities such as blood pressure and arthritis. In terms of delivery, participants felt that the program was well presented by knowledgeable non-healthcare personnel and felt that delivery was consistent throughout its duration.

"Well the location was very good for a start, it was very near the doctors and I go to the surgery so it was convenient for me" [I-7, attending]

"I thought that the people that presented it, without being doctors, nurses, pharmacists whatever, did a very good job and I'm tempted to think they might also use a language that's closer to that used by the participants than a medical professional" [I-18, attending]

Participants also expressed the usefulness of resources offered by the program including written materials and props which helped them to gain a better understanding of pre-diabetes and dietary choices. However, some expressed a preference for simple written materials instead of the book provided by the program. Negative experiences appeared to centre on the notion that the duration of the sessions was too long, with some describing the 2-hour sessions as 'heavy going'. Some participants also commented on aspects of the program such as exercise sessions that seemed irrelevant to them due to their age and co-morbidities. Group activities also received both positive and negative feedback with participants liking activities such as weighing and others not taking to some of the activities. Most participants who completed the program seemed to have a richer appreciation of the support and encouragement that the group-based sessions provided.

"Only attended one session. Found it was very long, unnecessary and rather patronising" [Q161, dropped-out].

"In the group I attended most of the people were 60 plus so the activities/exercise provided I think were for that age group and not mine" [Q-1, completed].

"A big benefit of the course was the group meetings. It wouldn't have meant anything to me if it hadn't have been for that. I actually look forward to going every week and listening to what other people have done that week; what they found easy what they found difficult. I thought that was brilliant I think that interaction was what made it for me" [FG-91, completed]

4. The role of community pharmacy in pre-diabetes

Quantitative analysis has indicated that people with pre-diabetes consider community pharmacy as capable of delivering DPS, with most agreeing that they would consider using this setting for such services. Table 7 presents identified barriers and facilitators for people with pre-diabetes engaging with community pharmacy-based DPS mapped onto the COM-B. The related target behaviour in this theme was 'people with pre-diabetes engaging with community pharmacy based DPS'.

Capability

Generally, participants who were unable to engage with the current national program due to various accessibility factors (e.g. time commitments) expressed a lack of knowledge of where to access alternative help. Therefore, with most participants also expressing a lack of knowledge about current community pharmacy-based public health services, it was felt that people with pre-diabetes would need to be informed about DPS provided in this setting to enable them to engage.

Opportunity

The community pharmacy setting was identified by the participants as accessible and convenient, particularly in terms of location and ease of making appointments. Participants felt that there is an opportunity for community pharmacy to deliver pre-diabetes screening and monitoring services with some expressing their willingness to attend and even pay for the services. Participants felt that the DPS delivered in this setting would be most appropriate for regular community pharmacy users due to established relationships.

A number of barriers that would have to be overcome to deliver the services such as lack of access to medical records, time, funding and staff resources were also identified. Whilst some participants felt that, due to space challenges, community pharmacy would be unable to deliver group-based sessions, others discussed concerns about privacy and confidentiality, which were mainly based on the set-up of community pharmacies and the tendency for advice to be given over-the-counter.

Most participants felt that the integration of community pharmacy DPS with general practice services could increase acceptability of service users. Participants also felt that delivering DPS in this setting could potentially decrease GP workload and thus decrease waiting times at general practices. Other participants who were less keen on the idea of community pharmacy delivering DPS explained that the service would be better provided by the general practice alone due to their increased access to medical records and familiarity. However, some participants acknowledged their views were based on pre-conceived ideas of the role of community pharmacy and reservations about them providing services that traditionally would be otherwise provided by general practices. Experiences with current community pharmacy services were largely medicine related and involved information provision or counselling. Apart from influenza vaccinations, there was a general lack of awareness of non-medicine related services, including diabetes

screening, offered in this setting. Generally, due to the lack of awareness of current community pharmacy services and its public health role, participants felt that community pharmacy based DPS would need to be promoted sufficiently to the targeted population for it to be successful.

Motivation

Motivations to access community pharmacy based DPS were largely reflective, where participants described basing decisions on their experiences and beliefs. Most respondents felt that delivering pre-diabetes screening and DPPs through community pharmacy was a good idea with some expressing that the setting could provide an alternative to those who don't like the group-based setting of the current national program. Those who had either completed the national DPP and had managed to revert their HbA_{1c} levels to normal ranges expressed that this setting could be useful for providing follow-on support and monitoring and would give them peace of mind due to ease of access.

Participants acknowledged that community pharmacy has the potential to deliver DPS but considered appropriate training and qualifications of personnel delivering services as key determinants for enhancing their motivation to engage. This indicated that participants were comfortable with the community pharmacy personnel delivering DPS as they felt it could be delivered by anyone providing they had the appropriate training. This aligned with other participant views about non-healthcare professionals delivering the NHS DPP successfully.

Willingness to participate in community based DPS was largely influenced by participants' experience with other services in this setting, with those who had negative experiences with prescription services strongly opposing the concept of community pharmacy delivering diabetes prevention interventions. Additionally, some participants who had attended the national DPP were sceptical about community pharmacy being able to deliver DPS. These participants expressed that having attended the current national program, which from their experience was a lengthy and comprehensive service, they were finding it difficult to envisage community pharmacy delivering a similar program.

Table 7: Barriers and facilitators to engaging with community pharmacy-based diabetes prevention services

COM-B model component	Component definitions	Mapped codes		
		Barriers	Facilitators	Illustrative quotes
Capability	Physical			
	Psychological	Knowledge of appropriate healthcare pathways		<i>"There are just so many avenues you can get medical advice through nowadays, and it gets very confusing"</i> [Q-25, waiting]
Opportunity	Physical		Convenient	<i>"It sounds like a convenient way for people to access screening and advice on how they can best avoid developing full blown diabetes"</i> [Q-94, attending]
			Accessible location	<i>"An excellent idea. Closer to home is a huge improvement. No long 1hour+ on cold wet days - that's 1hr minimum - on my trip into [location]"</i> [Q-48, declined]
		Inability to deliver group-based sessions Space challenges		<i>"I feel the group setting is a good way forward for a prevention service and I am not sure if this can be provided by community pharmacy with limited space"</i> [Q-110, completed]
		Confidentiality and privacy concerns		<i>"Would there be a private room available or enough space if it's a course and privacy and confidentiality. I hope it wouldn't be held or reviewed at the shop counter"</i> [Q-103, unknown participation status]
		Busy Uncertainty regarding appointments		<i>"Not sure if this would work as they always seem to be quite busy, unless it was done in appointment system"</i> [Q114-completed]
			Shorter waiting times	<i>"Probably far quicker than waiting for doctor's appointment. Prevention screening services? Excellent idea if carried out by professionals targeting specific ailments include "Wellman Clinic"</i> [Q127-waiting]
		Lack of access to medical records		<i>"I think the doctors have more accessibility to medical records for contacting people but the community pharmacy is always there for excellent advice"</i> [Q-26, completed]

			Potential to save GP time	<i>"That could actually save the doctors an awful lot of time and especially the climate at the moment is that hospitals doctors surgeries are at bursting point...it would be very useful for a chemist to take some of these more simple things which are very important to the body on board and free the public from standing in queues and free the surgeries from having too many people to attend to"</i> [I-7, attending]
		Understaffed	Extra resources e.g. 2 pharmacists	<i>"I don't feel that community pharmacies have the resources to provide an effective diabetes prevention services as this would require lengthy consultations to cover the many aspects involved"</i> [FG-11, attending]
		Funding cuts	Funding	<i>"I think community pharmacy I think would be it's not so much a commercial thing if you want would probably be a better option I'd love to see it but it's going to take a lot of investment in time people and money"</i> [I-18 completed]
			Potential to provide HbA _{1c} monitoring	<i>"If technology is moving away from having to send blood samples away and having to wait days for them to come back to the surgery... if modern equipment is able to do that in a pharmacy setting maybe there's an opportunity that might work"</i> [FG-11, attending]
			Willing to pay for screening services	<i>"If there'd been some way I'd have even paid for it to monitor my health in some way, which is where I was thinking you know community pharmacy if you could pay them to test you when you're 35 (HbA_{1c})"</i> [FG-25, waiting]
	Social	CP underutilised in England	Promotion of community pharmacy services	<i>"If you go abroad I mean in other countries the pharmacist is usually the first port...even in European countries where you don't pay for healthcare necessarily you go [to] a pharmacist to get advice"</i> [FG-25, waiting]
		Lack of awareness of community pharmacy services		<i>"I'm not aware of all the different things that chemists do, I didn't think they probably would measure your cholesterol and things like that I suppose it's possible"</i> [I-7, attending]
		Division between pharmacy and the rest of the medical profession	Diabetes prevention services must be linked to GP	<i>"You've got all sorts of people who have become involved with the surgery who weren't before...same with the pharmacist, if it was within that environment and they were all linked together and they had that interaction I think people would probably have more confidence"</i> [FG-11, attending]
		Prefers GP or nurse due to established relationship and cultural norms		<i>"Rather see the practice nurse as I know her"</i> [Q-65, waiting]

Motivation	Reflective		Possible alternative to group-based sessions	<i>"Possibly useful alternative to group sessions" [Q-166, dropped-out]</i>
			DPPs can be delivered by any trained personnel	<i>"I mean these courses were given by people who weren't doctors or pharmacist and hadn't had that amount of training, but they were trained to deliver this course and that was fine. I didn't need to have somebody who's got a degree" [FG-42, completed]</i>
		Qualifications	Training Pharmacists' knowledge and qualifications	<i>"The staff are very capable for my use so far, and I see no reason why with training they [community pharmacy staff] would be unable to do so [deliver DPS]" [I-29 declined]</i>
			Community pharmacy can provide support after NHS DPP	<i>"I would welcome continuing support after the programme completed" [Q-152, completed]</i>
		Sceptical about community pharmacy being able to deliver DPPs		<i>"It is so detailed and comprehensive [NHS DPP] that I'm finding it difficult how a local pharmacy is going to be able to provide that sort of advice, service and encouragement" [FG-11, attending]</i>
		Negative experiences with community pharmacy services Little or no experience of using community pharmacy services	Positive experiences with community pharmacy services	<i>"Having to wait at least 30 minutes in my pharmacy to collect prescriptions, they seem very disorganised with no system. I feel they would not be capable of providing this service efficiently" [Q-104, declined]</i> <i>"I haven't really had any experience with pharmacies...well I guess I'd have to trust them [to deliver DPS]. As I say I have no experience of ever going to them before, so I can't judge them on no experience" [I-115, dropped-out]</i>
	Automatic		Community pharmacy monitoring service would give patients peace of mind	<i>"I think to be able to go in for peace of mind cos I know sometimes I feel that if I've gone too long and not eaten my blood sugar goes down" [I-13, declined]</i>

Discussion

This research highlights that a one-size fits all approach should not be applied when delivering the DPP and that alternative delivery approaches should be explored to maximize reach ²³. Factors influencing engagement identified by this research not only highlight a potential role for community pharmacy in addressing accessibility barriers but could also inform pathways for signposting people with pre-diabetes into better suited DPP settings. This study also identifies important facilitators in the Capability (e.g. knowledge) and Opportunity (e.g. session times) domains of the COM-B theoretical behaviour change model that could be targeted when designing and implementing pre-diabetes interventions that could be delivered by community pharmacy teams.

The experience of being diagnosed with pre-diabetes, largely described as a feeling of shock by the participants in this study, and the subsequent motivation to make lifestyle changes, highlights a timely opportunity for the provision of suitable interventions in people with pre-diabetes. Previous research has highlighted the diagnosis of pre-diabetes as a 'window of opportunity' for healthcare professionals to support those diagnosed with pre-diabetes to implement lifestyle changes ⁵⁰. This research demonstrates scope for community pharmacy teams to deliver DPS for people diagnosed with pre-diabetes following screening as an alternative option to the current national program. Community pharmacy, well known for its accessibility, including long opening hours and weekends, was seen by people with pre-diabetes as a potentially accessible and convenient option, particularly for regular service users. Previous research exploring views and perceptions of the public towards community pharmacy screening services and its public health role has shown similar findings, identifying accessibility and convenience as positive aspects of community pharmacy ⁵¹⁻⁵³. However, in line with previous research, our findings have shown that although the community pharmacy setting could be a favourable choice for people who are employed and regular service users ^{54 55}, engagement could be hindered by lack of awareness of community pharmacy services and poor perceptions of the role and expertise of community pharmacy teams ^{51 54 56}. Additionally, strong views of pharmacists as drug experts ^{57 58}, preference for general practice settings by patients ⁵⁹ and lack of GP endorsement have also been highlighted by research as common hindrances to community pharmacy services uptake ^{23 42 55}.

In 2016, a review of community pharmacy clinical services in England highlighted similar behavioural constraints for accessing community pharmacy services including lack of awareness and expectation of the clinical care that pharmacy can and could deliver by patients, the public and other health care professionals ⁶⁰. The report highlighted that raising

awareness of community pharmacy services as well as increasing public perception and experience is crucial for changing behaviours. The review recommended building local peer relationships with other healthcare providers and using patient groups to raise awareness to people with different cultural backgrounds and age groups ⁶⁰.

This study demonstrates that engagement with community pharmacy based DPS could be influenced by perceptions of community pharmacy teams' capability (in terms of training and qualification) to deliver such services. Although this research indicates that regular community pharmacy users are more inclined to perceive community pharmacy to be capable of delivering DPS, the findings show that most people with pre-diabetes would be willing to engage with services in this setting if community pharmacy teams received appropriate training. A systematic review examining the beliefs and attitudes of consumers towards pharmaceutical public health, has shown similar findings suggesting that although most service users view pharmacists as appropriate providers of public health advice, they have mixed views on pharmacists' ability to do this ⁶¹. The review also found high satisfaction rates amongst those that had experienced community pharmacy based public health services and recommended the provision of training to increase pharmacists' confidence in providing these services.

Other intervention characteristics such as program content and delivery, seemed to influence retention of people with pre-diabetes following initial engagement. Characteristics such as session times and duration, were among factors identified by our study to influence those who dropped out of the national DPP. This reflects findings of the ComPoD study which evaluated an existing community-based DPP in parts of England (Exeter and Birmingham) and reported a similar proportion of people who had declined or dropped out ²⁰. The ComPoD study also identified inconvenient session times as a common barrier amongst non-engagers. Previous qualitative research which identified organising suitable session times for a group as a challenge for providers identified the need for session time flexibility in program delivery and ensuring sufficient physical access including transportation and parking ²³.

Finally, as this research suggests motivation to be an important factor influencing participation in DPPs, the provision of DPS in alternative settings to such as community pharmacy, which primarily serve to increase opportunity for engagement, could indirectly enhance motivation^{38 39}. This study also identified motivational factors such as patients' perceptions of their ability in making health choices and perceived reliability of alternative support options, as factors that have the potential to influence to engagement with the DPPs.

Such factors would therefore need to be taken into account when considering the primary targets of the NHS DPP. It is also important that patients motivated to make lifestyle changes without the support of DPPs are well provided with evidence-based information and resources.

Strengths and limitations

This is the first study investigating influences of participation in NHS DPP and exploring the role of community pharmacy in diabetes prevention. Demographic characteristics, which largely consisted of an elderly population, including a small proportion of employed people and fewer men than women, sufficiently represented that of Norfolk which largely consists of a white British population with a relatively older age profile compared to the rest of England⁶⁴. Participation demographics reflected both national NHS DPP figures and previous research which demonstrate increased uptake with age and a significantly lower attendance in men^{22 23 42 65 66}. Additionally, participation rates reflected local figures which demonstrate a 56% (95% CI 53 to 60) uptake rate (attendance of initial session) since initiation of the programme in June 2016²².

The mixed method, exploratory design enabled triangulation of findings to gain views of a wider pre-diabetes population. Using a theoretically informed approach to investigate the role of community pharmacy in diabetes prevention in this research presents a potential to inform development and implementation of services for people with pre-diabetes in this setting. The findings could also inform possible screening methods for signposting patients into better suited DPP settings.

The barriers and facilitators mapped to the COM-B components of this research will be taken forward to inform the development of a role of community pharmacy in diabetes prevention. Further work will look at linking the outcomes of this research through the Behaviour Change Wheel, a framework for developing behaviour change interventions^{38 39}, to develop appropriate interventions and strategies that could increase participation in both DPPs and also community pharmacy-based services. . This future work will also include components identified in a parallel study which explored the study objectives in healthcare professionals and commissioners⁶⁷.

One of the limitations of the study was the lack of diversity thus providing a limited perspective from people of other ethnic backgrounds. Additionally, the exclusion of non-English speakers could have also created a literacy and language barrier to participation in

both the NHS DPP and in this study, thus limiting the generalisation of findings to subpopulations⁶⁸. Another limitation was the low response rate to the questionnaire study which limited the number of questionnaires included in the analysis. With the majority of respondents constituting those who had expressed some interest in participating in the NHS DPP, social desirability may also be a bias in the responses received ⁶⁹. The use of an unvalidated questionnaire incorporating agree/disagree Likert scale, a scale which research suggests achieve results with lower reliability and validity due to acquiescence and cognitive burden, also poses a limitation in this study ⁷⁰. Furthermore, the exclusion of questions exploring perceived need of the program in engagers was a limitation that precluded further inferences to be made as to whether perceived need was a key barrier or not.

Rigorous methods were adopted for the conduct and reporting of this research to ensure trustworthiness of the findings ⁷¹. Triangulation of methods, achieved by using multiple methods of data collection including interviews, focus group and questionnaire added to the credibility of the research findings ⁷². Additionally, investigator triangulation was applied by involving several researchers, with a range of expertise, in conducting data analysis.

Transparency in describing research steps taken from study initiation to the reporting of the findings has been provided. A detailed description of the context and setting of the study, including the delivery and funding of the NHS DPP has also been provided to ensure transferability of the data ^{71 73}. Additionally, the processes and methods used in this research including participant inclusion and exclusion criteria, sampling strategy, topic guides and questionnaire have been thoroughly described to ensure that this research can be transferred to other contexts and settings. The analytical process of the study, particularly the mapping of barriers and facilitators to the COM-B theoretical model, was examined by an external psychologist (HF) with experience of applying the COM-B in designing interventions. This ensured that the interpretation of the findings was supported by data received from participants of the study, hence enhancing dependability and confirmability of the research findings ⁷¹.

The community pharmacy background of the main researcher (TK) could have influenced the analysis processes ⁷⁴. Therefore, in order to minimise the researchers' subjective influence on the interpretation of the findings, analyst triangulation was used to provide multiple perspectives in interpretation of results ⁷⁵. This was achieved through regular discussion with members of the research team during analysis to discuss the findings until the interpretation which best represented the meaning of the data was found. The backgrounds of the researchers in this study therefore included community pharmacy (TK,

MT, HF and CK), primary care research (MT) and psychology (HF). Additionally, the inclusion of participants with a diverse experience with community pharmacy services facilitated the presentation of balanced views about the potential role of community pharmacy in diabetes prevention ⁷⁵.

Conclusions

Community pharmacy is an acceptable setting for the delivery of DPS and could be a favourable alternative for people with work and social commitments, regular community pharmacy users and those seeking alternatives to the current national program. This research outlines factors that could influence the implementation of services in this setting with regards to engagement. Opportunity to engage with community pharmacy-based DPS services arises from its accessibility. Therefore, if community pharmacy were to provide DPS with flexible session times, which is possible given their extended opening hours, this could present a potential role for the setting in addressing some of the current barriers to engagement. Patient perceptions of community pharmacy's capability of delivering acceptable DPS could be influenced by knowing that community pharmacy teams are appropriately trained to deliver the services. In order to enhance motivation for people with pre-diabetes to engage with DPS, community pharmacy teams would need to build trusting relationships with this population and ensure endorsement by healthcare professionals such as GPs and nurses. The data in this paper provides evidence to inform intervention development as per the aims of the COM-B model of behaviour change. Further research, involving a thorough process evaluation alongside, would also be required to test the feasibility of the designed interventions and determine the cost-effectiveness of such a service in community pharmacy.

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